an injection nozzle installed on all four sides of said guide plate to inject air or nitrogen to a space proximate to the guide plate for removing the powder from the guide plate through an opening formed by the funnel-shaped guide.

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REMARKS

The Specification and claims 1, 4, 6, 7, 12, 13, 16, and 21 have been amended. Claims 1-21 are currently pending in the case. Further examination and reconsideration of the presently claimed application is respectfully requested.

Objection to the Drawings:

The drawings were objected to under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. In particular, the drawings were objected to for failing to show the "electrical power conductor," as described in claim 12, the "controller," as described in claim 13, and the "drain valve," as described in claim 16. To expedite prosecution, claim 12 has been amended to remove the "electrical power conductor" component, claim 13 has been amended to remove the "controller" component, and claim 16 has been amended to remove the "valve" portion of the "drain valve" component. Thus, the amendments to claims 12, 13, and 16 do not present new matter. Such amendments are believed to clarify the claim language in a manner that addresses the concerns expressed in the Office Action in regards to claims 12, 13, and 16. Accordingly, removal of the objections to the drawings is respectfully requested.

Objection to the Specification:

The Specification was objected to for informalities. The Examiner's thorough reading of the Specification is appreciated. In particular, statements in the Office Action suggest that on page 8, line 8, of the Specification, the reference numeral "30" should be changed to --10--. As shown above, the Specification has been amended in a manner that addresses the concerns expressed in the Office Action. Such an amendment is made merely to correct an erroneous reference numeral and, thus, does not present new matter. In addition, statements in the Office Action suggest that on page 9, line 21, of the Specification, the meaning of "slm" is unclear. As shown above, the Specification has been amended in a manner that addresses the concerns expressed in the Office Action. In support, the Applicant asserts that "slm" is a physical unit of measure commonly known in the art as "standard liters per minute," and

submits a list of conversion factors for physical units of measure obtained from an Internet website in **Attachment B**. Therefore, the Specification has been amended for clarification purposes only and, thus, does not present new matter. Accordingly, the removal of the objection to the Specification is respectfully requested.

Section 112, 2nd Paragraph, Rejections:

Claims 1-21 were rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Though the Office Action provides discussion of the objections to claims 1, 2, 4, 6, 13, 16-18, and 21, the Office Action does not provide discussion of the objections to remaining claims 3, 5, 7-12, 14-15, and 19-20. Therefore, the Applicant wishes to respond to the objections of claims 1, 2, 4, 6, 13, 16-18 and 21. To expedite prosecution, claims 1, 4, 6, 13, 16 and 21 have been amended without prejudice or disclaimer as to the subject matter recited therein. Such amendments are believed to clarify the claim language in a manner that addresses the concerns expressed in the Office Action with regard to claims 1, 4, 6, 13, 16 and 21.

In addition, the amendment of claim 16 is believed to clarify the claim language in a manner that addresses the concerns expressed in the Office Action with regard to claims 17 and 18. In particular, statements in the Office Action suggest "the drain" lacks positive antecedent basis. As shown above, amended claim 16 states in part: "...wherein said wetting chamber further comprises: a drain coupled to receive said sludge from said bottom portion ... ." Therefore, since claims 17 and 18 are dependent from claim 16, the recitation of "a drain" in amended claim 16 illustrates positive antecedent basis for "the drain" recited in claims 17 and 18.

Furthermore, the statement in the Office Action stating the use of "adapted to" in claim 2 does not constitute a limitation is respectfully traversed. "Adapted to" is used in the present claims to impart proper functional limitations. The use of "adapted to" in the present claims constitutes a functional limitation in that it defines something by what it does (e.g. burning flammable elements of a gas), rather than by what it is. Functional language does not, in and of itself, render a claim improper. *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971), MPEP 2173.05(g). The phrase "is adapted to" in the claims was stated in the Office Action to not constitute a positive limitation or a limitation in any patentable sense, with reference to *In re Hutchison*, 69 USPQ 138 (CCPA 1946). However, functional limitations involving "adapted to," like any other claim limitations, must be evaluated and considered for

what they fairly convey to a person of ordinary skill in the pertinent art. MPEP 2173.05(g). Such an evaluation may be used to show that functional limitations involving "adapted to" are definite and proper.

As such, the ability to achieve a particular functional limitation does place a structural limitation on the claimed element. For example, a limitation on a combustion chamber to burn flammable elements of a gas requires that the combustion chamber be configured to conduct a heating process of the gas. One of ordinary skill in the art of gas treatment would have no difficulty in determining whether a combustion chamber was adapted to burn flammable elements of a gas. The phrase "adapted to burn" in claim 2, therefore, provides a positive limitation on the design of the combustion chamber. For at least the reasons set forth above, the use of the phrase "adapted to" in the present claims (e.g., in claims 2, 3, and 6) is believed to limit these claims as to the function of the device.

Moreover, in regards to claim 6, the statement in the Office Action stating "high" and "low" are relative terms and therefore are vague and indefinite is respectfully traversed. The fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite under 35 U.S.C. 112, second paragraph. *Seattle Box Co., v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 221 USPQ 568 (Fed. Cir. 1984); MPEP 2173.05(b). Acceptability of the claim language depends on whether one of ordinary skill in the art would understand what is claimed, in light of the Specification. When a term of degree is presented in a claim, first a determination is to be made as to whether the Specification provides some standard for measuring that degree. MPEP 2173.05(b).

In particular, claim 6 states in part: "... wherein the combustion chamber comprises a relatively high temperature gas, wherein the wetting chamber comprises a relatively low temperature gas ... ." The Specification does provide a standard for measuring the degree of a relatively "high" temperature gas, as recited in claim 6. On page 9, lines 26-30, for example, the Specification states, "[t]he exhaust gas gains heat by passing through the heat exchange unit ... [e]ach heat exchange unit includes a ceramic heater 15a, which raises the temperature of an outer surface of the heat exchange unit to 800°C, and as a result, the flammable gas, such as hydrogen, and explosive elements are burned in the combustion chamber 10." As such, the Specification implicitly teaches a "high" temperature gas as having a temperature near approximately 800°C, due to heat transfer between the heat exchange units and the exhaust gas. In any case, the Specification explicitly states that the temperature of the "high" temperature gas must be high enough to burn flammable and explosive elements of the exhaust gas. Thus, in light of the Specification, one of ordinary skill in the art would understand that a "high" temperature, as described in claim 6, relates to the well-known temperatures required to combust flammable elements of an exhaust gas.

Similarly, the Specification provides a standard for measuring the degree of "a relatively low temperature gas," as recited in claim 6. For example, the Specification explicitly states that the "relatively high temperature gas" from the combustion chamber is passed into the wetting chamber where "the gas is cooled due to a cooling effect of water" (Specification -- page 10, line 18). As such, the wetting chamber may cool the exhaust gas from a temperature near approximately 800°C to a "relatively low temperature," which is substantially lower than approximately 800°C. In addition, the degree of the temperature difference between the "relatively high temperature gas" and the "relatively low temperature gas" is taught in the Specification. For example, on page 10, lines 6-8, the Specification states, "[d]ue to the temperature difference between the high temperature process of the combustion chamber 10 and low temperature process of the wetting chamber 30, a powder could be created above or on plate 61." As such, the Specification implicitly teaches the temperature of the "relatively low temperature gas" as being substantially lower than the temperature of the "relatively high temperature gas," such that a significant temperature difference between the two gases causes a powder formation. Thus, in light of the Specification, one of ordinary skill in the art would understand that "a relatively low temperature gas" relates to a temperature low enough to cause a powder formation when the high temperature gas comes in contact with the low temperature gas.

For at least the reasons set forth above, the claim language of claims 1, 2, 4, 6, 13, 16-18 and 21 is definite and particularly points out and distinctly claims the subject matter which the Applicant regards as the invention. In addition, the Applicant asserts that the claim language of claims 3, 5, 7-12, 14-15, and 19-20 is also definite and distinctly claims the subject matter, which the Applicant regards as the invention. Accordingly, removal of the §112, second paragraph, rejection of claims 1-21 is respectively requested.

Section 103 Rejections:

Claims 1-21 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,900,217 to Hartung et al. (hereinafter "Hartung") in view of Korean Patent Publication 97-9311 to Kim (hereinafter "Kim"). To establish a case of *prima facie* obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (C.C.P.A 1974); MPEP 2143.03. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed.Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); MPEP 2143.01. The cited art does not teach or suggest each and

every limitation of the currently pending claims, some distinctive limitations of which are set forth in more detail below.

None of the cited art provides motivation to teach or suggest a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber. Amended independent claim 1 states in part: "[a] gas scrubber comprising ... an injection nozzle having an opening adapted to deliver a conditioned gas to a space proximate to the guide plate for minimizing the production and/or accumulation of a powder at an interface between the combustion chamber and the wetting chamber." Amended independent claim 7 recites a similar limitation.

Support for the amended limitation may be found in the Specification, for example, on page 9, lines 5-9, which state: "[a]n injection nozzle 62 installed on all four sides of the guide plate 61 injects air or nitrogen to remove the powder through the space of the guide plate 61. According to one example, the powder may be removed laterally into the space above the guide plate. Alternatively, the powder may be removed through the opening of the four-sided guide plate downward into the wetting chamber." In addition, the Specification states, "nozzle 62 continuously supplies air or nitrogen to the plate material 61a of the guide plate 61 such that a high temperature gas and a low temperature gas do not come in contact with each other. As a result, the powder buildup at the border between the combustion chamber 10 and the wetting chamber 30 is prevented."

Hartung discloses an apparatus for purifying waste gases. Hartung, however, does not teach or suggest a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber. Statements in the Office Action suggest Hartung discloses the use of "a guide plate (16)... and an injection nozzle (19)" (Office Action -- page 4). In this manner, Hartung teaches "nozzle ring 19, with which water or an absorbent can be sprayed onto the inside of the inner pipe 16 ... so that deposits there can be removed or reduced." (Hartung -- col. 5, lines 11-15, emphasis added). As such, Hartung specifically teaches nozzle ring 19 is adapted to deliver "water or an absorbent" to remove or reduce deposits from the inside of inner pipe 16. Thus, Hartung does not teach that nozzle ring 19 is "adapted to deliver a conditioned gas." In fact, Hartung does not even mention the possibility of using a conditioned gas to remove or reduce deposits within the purifying apparatus. Therefore, Hartung provides no motivation to teach or suggest an injection nozzle adapted to deliver a conditioned gas for

minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber, as taught in present claims 1 and 7.

Kim discloses a gas scrubber for treating a flammable and explosive gas produced during the semiconductor manufacturing process. Kim, however, does not teach or suggest a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber. Kim does teach that conventional gas scrubbers often require "frequent maintenance ... due to a formation of a powder in the area where the gas flowing out from the gas chamber makes contact with water ..." (Kim -- page 2, lines 14-15). Kim also emphasizes that a disadvantage of conventional gas scrubbers is that "[w]henever the gas scrubber needs to be repaired, the main manufacturing system that produces the exhaust gas is put on hold thus effecting the productivity." (Kim -- page 2, lines 16-17).

As an improvement over conventional gas scrubbers, however, Kim specifically teaches a gas scrubber in which "wet chamber 40 is constructed with a main component comprised of the outer wall 46 and a detachable component having the partitions 42, 43, 44, 45. These components are assembled together with a flange coupled with a bolt 32, thus cleaning or repairing the device could be performed conveniently." (Kim -- page 8, lines 4-8). In this manner, though Kim discusses the disadvantages of a powder formation at an interface between a combustion chamber and a wetting chamber, Kim's solution to the problem is to construct a gas scrubber in a manner, which allows the device to be disassembled conveniently for cleaning or repairing purposes. In fact, Kim does not even mention the possibility of using a conditioned gas to minimize the powder formation. Therefore, Kim provides no motivation to teach or suggest a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber, as taught in present claims 1 and 7.

Furthermore, the cited art cannot be combined or modified in such a manner that teaches or suggests all limitations of present claims 1 and 7. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); MPEP 2143.01. As stated above, none of the cited art teaches or suggests an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber, as taught in present claims 1 and 7. Therefore, the cited art cannot be combined to teach or suggest such a limitation. In addition, none of the cited art even

mentions the possibility of using a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber, as taught in present claims 1 and 7. Therefore, none of the cited art can be modified to teach or suggest such a limitation.

For at least the reasons set forth above, none of the cited art provides motivation to teach or suggest all of the limitations of independent claims 1 and 7. Therefore, claims 1 and 7 as well as claims dependent therefrom, are asserted to be patentably distinct over the cited art. Accordingly, removal of the §103(a) rejections of claims 1-21 is respectfully requested.

CONCLUSION

In this response, the Specification and claims 1, 4, 6, 7, 12, 13, 16, and 21 have been amended. The objections to the drawings and the Specification have been addressed. In addition, the rejection of claims 1-21 have been addressed. Therefore, this response constitutes a complete response to all issues raised in the Office Action mailed May 17, 2002. In view of the remarks traversing the rejections, Applicants assert that pending claims 1-21 are in condition for allowance. If the Examiner has any questions, comments, or suggestions, the undersigned attorney earnestly requests a telephone conference.

No fees are required for filing this amendment; however, the Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment, to Conley, Rose & Tayon, P.C. Deposit Account No. 50-1505/5480-00201.

Respectfully submitted,

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ATTACHMENT A
"Marked-Up" Amendments

IN THE SPECIFICATION

Please amend pg. 6, line 23 - pg. 7, line 2, of the amended Specification (Attachment A of the Response to the Office Action mailed October 4, 2000) as follows:

The heating means may include a heating chamber 14 and a plurality of heat exchange units 15 placed in line from an upper to a lower part of the heating chamber 14, forming two rows. The heat exchange units may comprise Inconel® tubes that are placed in double lines, which run from the upper part to the lower part of the heating chamber 14, in order to supply heat evenly to the exhaust gas. The temperature can be adjusted by adding or reducing heat to the (or the number of) Inconel® tubes. A ceramic heater 15a that generates heat with electricity is placed in the inside of the heat exchange unit 15. An insulator such as quartz 15b, which is a heat retention material, is placed between the heater 15a and heat exchange unit outer surface.

Please amend pg. 7, lines 4-13, of the amended Specification (Attachment A of the Response to the Office Action mailed October 4, 2000) as follows:

A controller (not illustrated in the drawings) controls the amount of heat by regulating the flow of electricity. The heaters 15a are divided into two sets and two different sets of electricity supply means are connected to the heaters, respectively. [And when]When electricity is discontinued in one set of the heaters, twice the amount of electricity is then supplied to the other set of heaters to generate twice the amount of heat [to those]within the other set of heaters. The heater 15a is connected to an electric wire ([or]i.e., electric power conductor, not illustrated in the drawings) with a clamp made of a stainless material, and when the high temperature is transmitted, oxidation or thermal variation may occur upon the clamp which can result in breakage of a wire. In order to prevent the thermal variation or the oxidation occurring in the clamp, a nitrogen nozzle 16 is attached to supply nitrogen across the clamp, to cool the clamp and prevent oxidation thereon.

Please amend pg. 8, lines 4-15, of the amended Specification (Attachment A of the Response to the Office Action mailed October 4, 2000) as follows:

After passing through the combustion chamber 10 and the explosive and flammable elements are removed, the gas flows into the wetting chamber 30, which is placed below the combustion chamber 10 forming a single unit. The wetting chamber 30 comprises a case having a central part that is formed with a plurality of partitions 31a configured to form a passage where the gas enters from the combustion chamber [30]10, and a lower part containing water. A plurality of absorbers installed in the gas passage formed by the partitions 31a of the case 31 are then used to dissolve the water soluble harmful elements contained in the gas as the gas flows in an up and down direction along the passage and passes through a plurality of absorbers 32 alternatively. A shower nozzle 33 installed above each absorber sprays water to the corresponding absorber, and an exhaust pipe 50 is used to let out the treated gas removed of the harmful elements to the atmosphere.

Please amend pg. 8, lines 17-24, of the amended Specification (Attachment A of the Response to the Office Action mailed October 4, 2000) as follows:

The bottom of the case 31 is formed in v-shape for collecting byproduct particles. A drain 41 and a water nozzle 42 are installed at the lateral side of the v-shape bottom. A sensor 34 is placed above the drain 41 to monitor the water level. An output signal from the sensor 34 initiates the water nozzle 42 to inject water to push the water-entrained particles, or sludge, out to the drain 41 when the sludge gathered at the bottom of the case 31 reaches a certain amount and causes [rise of] the water level to rise. A transparent plate 44 is hinged on one side of the case so that the water level could be checked from outside in case the sensor malfunctions.

Please amend pg. 9, lines 16-24, of the amended Specification (Attachment A of the Response to the Office Action mailed October 4, 2000) as follows:

Figs. 6 and 7 are hereby used to illustrate various methods for treating the gas produced during the semiconductor manufacturing process with the gas scrubber. The gas comprising hydrogen and other noxious elements that were not treated in the CVD furnace is fed into the combustion chamber 10 through the gas intake 11, 11'. A number of the gas intakes 11, 11' used is preferably based on the maximum capacity of the gas scrubber. For example, if the maximum capacity of the gas scrubber is 2000 slm (i.e., standard liters per minute), then four exhaust gas service pipes connected to four devices that exhaust 500

slm of exhaust gas should be formed. The modular addition of exhaust gas pipes and associated combustion chambers is thereby contemplated.

Please amend pg. 11, lines 20-23, of the amended Specification (Attachment A of the Response to the Office Action mailed October 4, 2000) as follows:

Furthermore, the gas scrubber automatically removes a powder buildup in the heat exchange units 15 of the heater chamber and prevents the powder buildup at the border between the combustion chamber and the wetting chamber so that stoppage of the system to remove the powder is no longer necessary.

IN THE CLAIMS

Please amend claims 1, 4, 6, 7, 12, 13, 16, and 21 as follows:

1. (Thrice Amended) A gas scrubber comprising:

a combustion chamber;

a wetting chamber placed below said combustion chamber to form a single unit;

a guide plate arranged between the combustion chamber and the wetting chamber for directing a gas from the combustion chamber into the wetting chamber; and

an injection nozzle having an opening adapted to deliver a conditioned gas [above]to a space proximate to the guide plate for minimizing the production and/or accumulation of a powder at an interface between the combustion chamber and the wetting chamber.

4. (Twice Amended) The gas scrubber according to claim 1, wherein the wetting chamber comprises:

an angled bottom surface which collects particulates produced in the wetting chamber; and

a water expulsion nozzle having an opening directed to the angled bottom surface for flushing the particulates into a drain.

6. (Thrice Amended) The gas scrubber according to claim 5, wherein the combustion chamber comprises a relatively high temperature gas, wherein the wetting chamber comprises a relatively low temperature gas, and wherein the [conditioned gas prevents]injection nozzle is adapted to prevent the high temperature gas from coming in contact with a substantial portion of the low temperature gas.

7. (Four Times Amended) A gas scrubber comprising:

a combustion chamber for eliminating explosive and flammable elements contained in a gas delivered into the combustion chamber from a gas intake;

a wetting chamber placed below said combustion chamber to receive the gas from the combustion chamber and dissolve a water soluble element of the gas[, wherein said wetting chamber comprises a plurality of partitions to direct the gas from said combustion chamber through a centralized region of the wetting chamber]; and

a means for minimizing a powder produced at an interface between said combustion chamber and said wetting chamber, wherein said means for minimizing a powder comprises a means for delivering a conditioned gas to said interface.

12. (Twice Amended) The gas scrubber according to claim 9, wherein the combustion chamber comprises a nitrogen delivery nozzle having an opening directed into the heating chamber, and wherein the nitrogen delivery nozzle directs nitrogen across an interface [between]proximate to the multiple heat exchange units[and an electrical power conductor].

13. (Twice Amended) The gas scrubber according to claim 9, [further comprising a controller adapted to regulate the flow of electricity to the multiple heat exchange units, wherein twice the amount of electricity is supplied to one set of heat exchange units when electricity flow to a corresponding set of heat exchange units is terminated]wherein the multiple heat exchange units comprise a first row and a second row of heat exchange units, and wherein if power to the first row of heat exchange units is terminated, power to the second row of heat exchange units is increased.

16. (Twice Amended) The gas scrubber according to claim 15, wherein a bottom portion of said case is configured in a v-shape to collect sludge residing in said bottom portion, wherein said sludge comprises particles entrained in water, and wherein said wetting chamber further comprises:

a drain [valve]coupled to receive said sludge from said bottom portion; and

a water nozzle coupled to a side of [the]said bottom portion.

21. (Twice Amended) The gas scrubber according to claim [15]7, wherein said means for minimizing a powder includes:

a guide plate comprising a funnel-shaped guide configured to direct the gas from said combustion chamber to said wetting chamber; and

an injection nozzle installed on all four sides of said guide plate to inject air or nitrogen [above]to a space proximate to the guide plate for removing the powder from the guide plate through an opening formed by the funnel-shaped guide.